EXHIBIT Z

TRIANGLE
ECONOMIC
RESEARCH

Lower Fox River and Bay of Green Bay: Assessment of Potential Recreational Fishing Losses and Restoration Offsets

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1. INTRODUCTION

This document (hereinafter called "Fishing Assessment") provides support for a settlement of natural resource damages claims by the State of Wisconsin against Fort James Corporation (hereinafter called "Fort James"). The analyses presented in this document are based on data collected under the cooperative agreement among the State of Wisconsin and a group of companies known as the Fox River Group relating to the assessment of natural resource damages. However, the analyses in this Fishing Assessment were made on behalf of Fort James and the State solely for the purposes of settlement. The Fox River Group has had no involvement in these analyses, and Fort James does not endorse the use of the Fishing Assessment or any of the model results and assumptions for any other purpose.

This assessment should be read together with the report entitled "Lower Fox River and Green Bay: Assessment of Potential Ecological Losses and Restoration Offsets" (ARCADIS JSA 2000) (hereinafter called "Ecological Assessment"), which also was prepared in support of the settlement of natural resource damages claims by the State of Wisconsin against Fort James Corporation. That report evaluates natural resource injuries potentially resulting from releases of PCBs to the Lower Fox River and the Bay of Green Bay and the losses of ecological services (services provided by one natural resource to another) potentially resulting from those injuries. This document, on the other hand, evaluates the losses of human use services (services provided directly to people through their use of the resources) potentially resulting from such natural resource injuries.

2. OVERVIEW OF THE EFFECT OF PCB RELEASES ON HUMAN-USE SERVICES

In 1999, the State of Wisconsin issued a plan for an assessment of natural resource damages potentially resulting from releases of hazardous substances to the Lower Fox River and Bay of Green Bay (hereinafter "State Assessment Plan"). The State did so in its role as trustee for all natural resources within the State. The plan

provided for an assessment that would be consistent with the natural resource damages assessment (NRDA) regulations promulgated by the U.S. Department of the Interior (DOI) (43 *CFR* Part 11). The State Assessment Plan also calls for using a restoration-based approach, consistent with the National Oceanographic and Atmospheric Administration regulations for natural resource damages assessment.

The assessment, which is still being conducted by the State and the Fox River Group, is designed to determine and quantify injuries to natural resources potentially affected by PCB releases to the Lower Fox River and Bay of Green Bay (Assessment Area)1, in terms of both ecological impacts and losses of services to humans. In addition, the assessment is focused on achieving full compensation to the public through what has become known as "compensatory restoration." In other words, the assessment is designed to determine what types and amounts of resource preservation and restoration projects would do the following: (1) bring natural resources or the services they provide back to "baseline" levels (the levels that would have existed but for the release of PCBs) and (2) compensate the public for any measurable interim losses of ecological and human-use services that occurred because of the PCBs before baseline services are restored.

2.1 Human Use Services Addressed in the Assessment Plan

The State Assessment Plan identified a preliminary list of six human-use services that may have been affected by PCB releases to the Fox River:

- Recreational fishing
- Waterfowl hunting
- Swimming
- Boating
- Bird-watching
- Trapping

[1] For the purposes of this settlement, the Assessment Area includes all of Green Bay and all of its tributaries up to the first dam or obstruction. This includes the Fox River up to the DePere Dam. Potential losses for fish consumption advisories from Lake Winnebago to the DePere Dam are not included because they are upstream of the Fort James facilities. Fort James is not liable for upstream releases.

Under the State Assessment Plan, in order for human-use service losses to be compensable, three conditions must be met:

- There must be a causal link between the injury and the service loss.
- The reduction in services must be quantifiable.
- The costs of quantification must be reasonable.

Of the potential human-use service losses listed above, only the potential losses from recreational fishing meet all three criteria. These losses result from the fish consumption advisories issued by the State and covering the Assessment Area. Therefore, this Fishing Assessment focuses exclusively on recreational fishing. The results for the other human-use services are summarized in Appendix A.

Human-use services potentially have two components: use values, which are based on use of a resource, and "non-use" or "passive-use" values. Non-use values are the values people derive from a resource that is independent of their use of the resource. Non-use values are measured with a controversial technique known as contingent valuation, which relies solely on survey respondents' answers to hypothetical questions about the value of resources. Appendix B discusses the lack of consensus about the reliability of contingent valuation methodologies. Because these values cannot be reliably quantified, the State Assessment Plan does not include non-use values.

2.2 Summary of Assessment for Human-Use Services

Based on the analyses conducted for the Fishing Assessment, the State and Fort James have selected a number of recreation projects that will compensate for the potential losses from the fish consumption advisories. As shown in Table 2.1, these projects will offset from 32 to 65 percent of the potential losses. Moreover, although the compensatory restoration approach does not use monetary values, the monetary value of these projects can be estimated using standard values from the economics literature. The estimated range of the monetized human use service gains from these projects is $16.8 to $55.8 million.

Table 2.1
Restoration Project Benefits

Percent of Service Losses Offset	32% to 65%
Monetary Value of Services from Restoration Projects	$16.8 to $55.8 million

3. OVERVIEW OF FISHING ASSESSMENT METHODS

The Fishing Assessment quantifies the potential human-use losses resulting from fish consumption advisories. According to DOI regulations, fish consumption advisories are evidence of an injury to fishing services. The advisories can result in changes in angler behavior, such as a reduction in the number of fishing trips taken, changes in fishing location, or changes in fish preparation. These changes can result in a loss to anglers of "utility," an individual's level of well-being or satisfaction from the fishing experience. Because the State has issued fish consumption advisories for several species of fish in the Assessment Area, the Fishing Assessment estimates the potential losses in utility, measured in "utils," associated with the changes in angler behavior potentially resulting from the advisories. "Utils" are a unit of measurement used by economists to measure the utility or satisfaction enjoyed from the consumption of a good or use of a service, much like service-acre-years is a unit of measurement of habitat services for Habitat Equivalency Analysis.

The Fishing Assessment uses the compensatory restoration approach for determining the compensation to the public for potential losses from fish consumption advisories. Under this approach, recreation projects are developed that provide at least the same number of "utils" as fishing trips to the Assessment Area would have provided if there were no fish consumption advisories. Data collected for this Fishing Assessment clearly show that anglers derive satisfaction from a wide variety of outdoor recreation activities. Survey results show that anglers in the Lake Michigan District of Wisconsin not only took over 900,000 single-day fishing trips, but also took over 900,000 outdoor recreation trips that did not involve fishing during June to September 1998. Therefore, the restoration projects include projects that improve general outdoor recreation as well as projects that improve fishing trips. Finally, outdoor recreators who

This approach is not sensitive to species-specific advisories and assumes that anglers react if there is an advisory on any species that is typically caught to eat. This approach is consistent with other studies of angler reaction to fish consumption advisories that use very simple advisory specifications at a single point in time.[5] This simple advisory specification, however, could lead to inaccurate estimates of potential losses over time. This is because changes in the actual advisories that apply to the Assessment Area cannot be reflected in the model. This potential problem was corrected in the aggregation procedures discussed in Appendix G.

5.3 Actual Trip Outdoor Recreation Model

The Actual Trip Outdoor Recreation Model estimates the gains from nature centers, hiking trails, and other facilities based on actual trips by anglers and outdoor recreators. The definition of the site characteristics is straightforward; therefore, the hypothetical data do not need to be used to construct an index to form a counterpart to the Fishing Advisory Index Model.

5.4 Joint Outdoor Recreation Model

The Joint Outdoor Recreation Model is also used to estimate gains from nature centers, biking trails, and other facilities. As in the Joint Fishing Model, the actual trip data are given 50 percent weight and the hypothetical trip data are given 50 percent weight.

6. QUANTIFICATION OF POTENTIAL LOSSES AND RESTORATION GAINS

The 1998 survey data provide a snapshot of angling activity. The models provide estimates of the losses for the anglers in the sample during the survey period. To estimate total losses, the survey results are aggregated to reflect the losses of all anglers from 1981, the first full year after the passage of the Comprehensive

5 This severity only approach is necessary because of the statistical methods used to estimate the Joint Fishing Model (Appendix F).

Environmental Response, Compensation, and Liability Act (CERCLA), until the advisories are removed. The gains will occur from the time the restoration projects are built until they fully depreciate in 50 years. The procedures used to aggregate losses and gains follow standard survey and economic methodology and are described in Appendix G.

6.1 Summary of Total Potential Losses and Gains

Table 6.1 summarizes the total potential losses and the gains. The Fishing Assessment shows the potential losses related to angling in the Assessment Area[6] range from 51.8 to 135.0 million utils. The low end of the range of losses is based on the Advisory Index Model, while the high end of the range is based on the Joint Fishing Model. The gains from the restoration projects range from 33.7 to 43.0 million utils. The low end of the range of gains is based on the Advisory Index Model and the Actual Trip Outdoor Recreation Model. The high end of the range of gains is based on the Joint Fishing Model and the Joint Outdoor Recreation Model.

Table 6.1 also shows the percentage of losses offset by the restoration projects. Using the low-end estimates of losses and gains, the potential gains offset 65 percent of the potential losses. Using the high-end estimates of losses and gains, the potential gains offset 32 percent of the potential losses.

Table 6.1
Potential Fishing Losses and Gains from Restoration

Category	Range of Results
Potential Fishing Losses (Millions of utils)	51.8 – 135.0
Gains (Millions of utils)	33.7 – 43.0
Percent offset	65% – 32%

[6] For the purposes of this settlement, the Assessment Area includes all of Green Bay and all of its tributaries up to the first dam or obstruction. This includes the Fox River up to the DePere Dam. Potential losses for fish consumption advisories from Lake Winnebago to the DePere Dam are not included because they are upstream of the Fort James facilities. Fort James is not liable for upstream releases.

APPENDIX G
QUANTIFICATION OF POTENTIAL LOSSES AND GAINS

This appendix describes the methods used for the purposes of this settlement for estimating total losses from the Advisory Index Model, total losses from the Joint Fishing Models, and gains from the restoration projects.

G.1 Total Potential Losses for the Advisory Index Fishing Model

There are six steps for computing total potential losses:

1. Convert sample losses to population losses.
2. Convert single-day fishing losses to losses for total fishing days.
3. Convert seasonal losses to annual losses.
4. Compute losses for years prior to 1998.
5. Compute losses for future years.
6. Compute the discounted present value of past and future losses.

Each of these steps is described below.

Convert Sample Losses to Population Losses

The losses for each sample angler are multiplied by the population weight for their stratum to estimate the losses for all anglers. The population weights are calculated using standard survey practices for a random selected sample.

Convert Single-Day Fishing Losses to Losses for Total Fishing Days

The estimates for fishing losses are based on single-day fishing trips. The Fishing Assessment assumes that the losses for trips excluded from the models (e.g., multiple-day trips and trips from private launches) are proportional to single-day losses. Therefore, because single-day trips are 56.6 percent of total fishing days in the Assessment Area, the results for single-day trips are scaled up by 1.77 (1/0.566).

Convert Seasonal Losses to Annual Losses

The model's seasonal loss estimates are converted to reflect losses over the entire year by using a scale factor based on anglers' annual number of fishing days. During the telephone survey, anglers provided estimates of the number of days they fish during each of the four seasons for a typical year. The scale factor is the total number of fishing days for the typical year divided by the number of fishing days from June to September of a typical year. The scale factor is 1.7.

Compute Losses for Years Prior to 1998

The 1998 potential losses use the model to estimate the value of removing the advisories as they exist in 1998. This same method is used to calculate historical losses. The actual advisories as they existed in previous years for the Assessment Area are used to construct the advisory index for each of those years. The difference between the "existing" utils and the baseline utils are the potential losses for that year.

Compute Losses for Future Years

The actual remediation program under the RI/FS has not been determined and the dates when the fish consumption advisories can be removed are unknown. For the purposes of this settlement, the State and Fort James have agreed to use the dates contained in Table G.1.1. These dates are broadly consistent with the dates the advisories would be removed under natural recovery (without any active sediment remediation) and are therefore conservative. Under these calculations the last advisory for sport-caught fish in the Assessment Area will be removed in 2090. The difference between the "existing" utils in future years with advisories and the baseline are the potential losses.

Compute the Discounted Present Value of Past and Future Losses

Discounting recognizes that people prefer to fish in the present rather than postpone fishing to some future time. Based on NOAA guidelines, 3 percent is used as the discount rate. All losses are discounted to 2000 values.